Claims

1. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) an anionic or cationic sizing dispersion; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups, the anionic polymer being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

2. The process according to claim 1, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

3. The process according to claim 1, wherein the anionic polymer having an aromatic group comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer having an aromatic group comprised in the sizing promoter

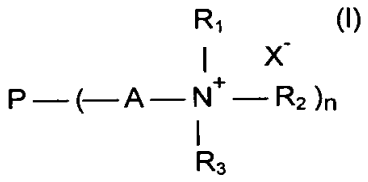
4. The process according to claim 1, wherein the sizing dispersion comprises a cellulose-reactive sizing agent.

5. The process according to claim 1, wherein the sizing dispersion comprises ketene dimers or acid anhydrides.

6. The process according to claim 1, wherein the sizing dispersion comprises acid anhydrides.

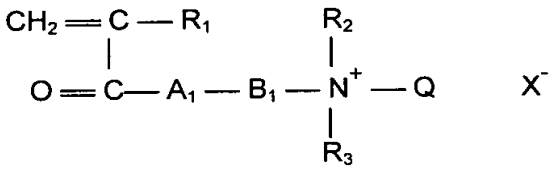
7. The process according to claim 1, wherein the cationic organic polymer is a cationic polysaccharide or a cationic vinyl addition polymer.

8. The process according to claim 1, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; and/or vinyl addition polymers obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):



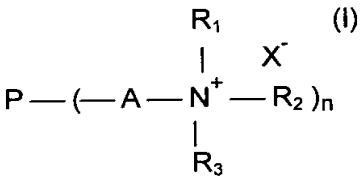
(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

9. The process according to claim 1, wherein the cationic organic polymer is selected from cationic polysaccharides.

10. The process according to claim 1, wherein the cationic organic polymer is selected from cationic starch.

11. The process according to claim 1, wherein the cationic polymer is selected from cationic polysaccharides having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

12. The process according to claim 11, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

13. The process according to claim 1, wherein the anionic polymer is a step-growth polymer or a naturally occurring aromatic polymer.

14. The process according to claim 1, wherein the anionic polymer is a naphthalene sulphonate condensation polymer or modified lignin polymer.

15. The process according to claim 1, wherein the anionic polymer having an aromatic group is condesated naphthalene sulphonate or lignin sulphonate.

16. The process according to claim 1, wherein the conductivity of the suspension is at least 4.5 mS/cm.

17. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

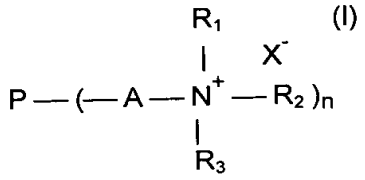
(i) an anionic or cationic sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

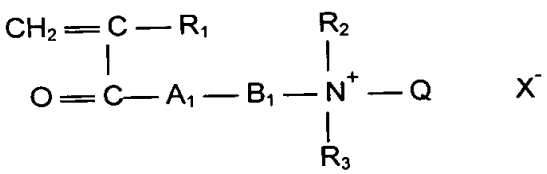
18. The process according to claim 17, wherein the cationic organic polymer is a cationic polysaccharide or a cationic vinyl addition polymers.

19. The process according to claim 18, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; or a vinyl addition polymer obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):

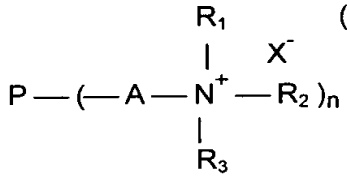


(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

20. The process according to claim 17, wherein the cationic organic polymer is cationic polysaccharide.

21. The process according to claim 20, wherein the cationic organic polymer is a cationic polysaccharide having th structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

22. The process according to claim 21, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

23. The process according to claim 17, wherein the anionic polymer is a step-growth polymer or naturally occurring aromatic polymer.

24. The process according to claim 23, wherein the anionic polymer is a naphthalene sulphonate condensation polymer or modified lignin polymer.

25. The process according to claim 24, wherein the anionic polymer is condesated naphthalene sulphonate or lignin sulphonate.

26. The process according to claim 17, wherein the sizing agent is a cellulose-reactive sizing agent.

27. The process according to claim 26, wherein the sizing agent is ketene dimer or acid anhydride.

28. The process according to claim 26, wherein the sizing agent is acid anhydride.

29. The process according to claim 17, wherein the conductivity of the suspension is at least 4.5 mS/cm.

30. The process according to claim 17, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

31. The process according to claim 17, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

32. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

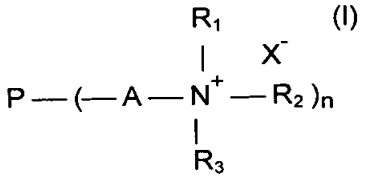
(i) an anionic or cationic sizing dispersion comprising a sizing agent, a cationic organic polymer having one or more aromatic groups and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups, and an anionic polymer having one or more aromatic groups being a step-growth polymer, a polysaccharide or a naturally occurring aromatic polymer; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

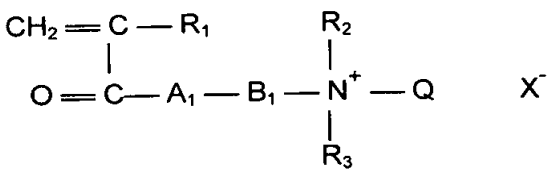
33. The process according to claim 32, wherein the cationic organic polymer of the sizing dispersion and sizing promoter is a cationic polysaccharide or a cationic vinyl addition polymer.

34. The process according to claim 33, wherein the cationic organic polymer of the sizing dispersion and sizing promoter is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion; or a vinyl addition polymer obtained by polymerising a cationic monomer or a monomer mixture comprising a cationic monomer represented by the general formula (II):

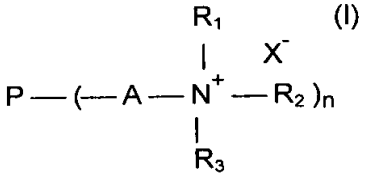


(II)

wherein R_1 is H or CH_3; R_2 and R_3 are each an alkyl group having from 1 to 3 carbon atoms, A_1 is O or NH, B_1 is an alkylene group having from 2 to 8 carbon atoms or a hydroxy propylene group, Q is a substituent containing an aromatic group, and X^- is an anionic counterion.

35. The process according to claim 32, wherein the cationic organic polymer of the sizing dispersion and sizing promoter is cationic polysaccharide.

36. The process according to claim 35, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

37. The process according to claim 36, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

38. The process according to claim 32, wherein the anionic polymer of the sizing dispersion and sizing promoter is a step-growth polymer or naturally occurring aromatic polymer.

39. The process according to claim 38, wherein the anionic polymer is a naphthalene sulphonate condensation polymer or a modified lignin polymer.

40. The process according to claim 39, wherein the anionic polymer is condesated naphthalene sulphonate or lignin sulphonate.

41. The process according to claim 32, wherein the sizing agent is a cellulose-reactive sizing agent.

42. The process according to claim 32, wherein the conductivity of the suspension is at least 4.5 mS/cm.

43. The process according to claim 32, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

44. The process according to claim 32, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

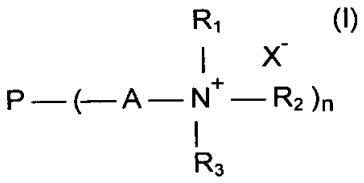
45. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) an anionic or cationic sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

46. The process according to claim 45, wherein the cationic organic polymer is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

47. The process according to claim 46, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

48. The process according to claim 45, wherein the anionic polymer of the sizing dispersion and promoter is condensated naphthalene sulphonate or lignin sulphonate.

49. The process according to claim 45, wherein the sizing agent is a cellulose-reactive sizing agent.

50. The process according to claim 45, wherein the conductivity of the suspension is at least 4.5 mS/cm.

51. The process according to claim 45, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

52. The process according to claim 45, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

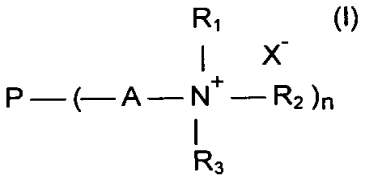
53. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) an anionic or cationic sizing dispersion comprising a sizing agent, a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide, and an anionic polymer having one or more aromatic groups being a naphthalene sulphonate condensation polymer or a modified lignin polymer; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

54. The process according to claim 53, wherein the cationic organic polymer of the sizing dispersion and promoter is a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion.

55. The process according to claim 54, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1

and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

56. The process according to claim 53, wherein the anionic polymer of the sizing dispersion and promoter is condensated naphthalene sulphonate or lignin sulphonate.

57. The process according to claim 53, wherein the sizing agent is a cellulose-reactive sizing agent.

58. The process according to claim 53, wherein the conductivity of the suspension is at least 4.5 mS/cm.

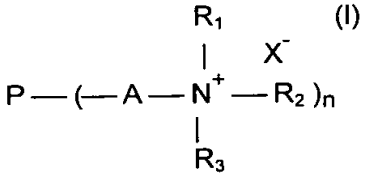
59. The process according to claim 53, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

60. The process according to claim 53, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

61. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) an anionic or cationic sizing dispersion comprising a sizing agent and an anionic polymer having one or more aromatic groups being condensated naphthalene sulphonate or lignin sulphonate, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being condensated naphthalene sulphonate or lignin sulphonate; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

62. The process according to claim 61, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

63. The process according to claim 61, wherein the sizing agent is a cellulose-reactive sizing agent.

64. The process according to claim 61, wherein the conductivity of the suspension is at least 4.5 mS/cm.

65. The process according to claim 61, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

66. The process according to claim 61, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

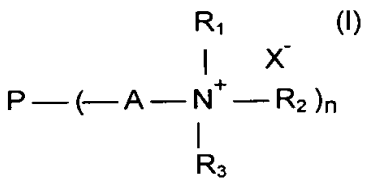
67. The process according to claim 61, wherein the sizing agent is present in the dispersion in an amount of from about 0.1 up to about 50 % by weight based on total emulsion.

68. The process according to claim 61, wherein anionic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.

69. The process according to claim 61, wherein cationic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.

70. A process for sizing paper which comprises adding to an aqueous suspension containing cellulosic fibres, and optional fillers,

(i) an anionic or cationic sizing dispersion comprising a sizing agent, a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide having the structural formula (I):

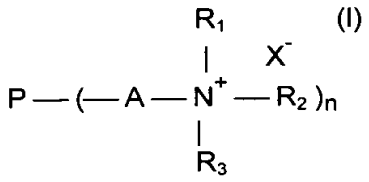


(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2

up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being condensated naphthalene sulphonate or lignin sulphonate, the amount of added sizing dispersion to the suspension being from about 0.01 % up to about 5.0 % by weight calculated as sizing agent based on dry fibres; and

(ii) a sizing promoter comprising a cationic organic polymer having one or more aromatic groups being a cationic polysaccharide having the structural formula (I):



(I)

wherein P is a residue of a polysaccharide; A is a chain of atoms comprising C and H atoms attaching N to the polysaccharide residue, R_1 and R_2 are each H or a hydrocarbon group, R_3 is an aromatic hydrocarbon group, n is an integer from 2 up to 300000, and X^- is an anionic counter ion, and an anionic polymer having one or more aromatic groups being condensated naphthalene sulphonate or lignin sulphonate; the amount of cationic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre, and the amount of anionic polymer added to the suspension being from about 0.001 % up to about 3 % by weight based on dry fibre,

forming and draining the obtained suspension, wherein the sizing dispersion and sizing promoter are added separately to the aqueous suspension.

71. The process according to claim 70, wherein A is an alkylene group with from 2 to 18 carbon atoms, optionally interrupted or substituted by one or more heteroatoms; R_1 and R_2 are each H or an alkyl group having from 1 to 3 carbon atoms; R_3 is a bezyl or phenylethyl group.

72. The process according to claim 70, wherein the sizing agent is a cellulose-reactive sizing agent.

73. The process according to claim 70, wherein the conductivity of the suspension is at least 4.5 mS/cm.

74. The process according to claim 70, wherein the cationic organic polymer and the anionic polymer comprised in the sizing promoter are added separately to the aqueous suspension.

75. The process according to claim 70, wherein the anionic polymer comprised in the sizing promoter is added to the aqueous suspension after both the sizing dispersion and the cationic organic polymer comprised in the sizing promoter.

76. The process according to claim 70, wherein the sizing agent is pres nt in the dispersion in an amount of from about 0.1 up to about 50 % by weight based on total emulsion.

77. The process according to claim 70, wherein anionic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.

78. The process according to claim 70, wherein cationic polymer of the sizing dispersion is present in an amount of from about 0.1 % up to about 15 % by weight based on sizing agent.